C. Amendments to the Specification

Amend paragraph 1 to read:

[0001] This application is a continuation-in-part of the inventor's US patent application having serial number 10/192,176 filed on 07/10/2002, now issued as US 6,684,847. The disclosure of ~~application number 10/192,176~~ US 6,684,487 is incorporated herein by reference.

Amend paragraph 8 to read:

[0008] The present application improves over the inventor's US patent 6,684,847 ~~pending application serial No. 10/192,346~~ by providing a supercharging capability, which includes an integrated axial fan portion within the rotor assembly. Moreover, the improved engine includes a simplified disposition of ports and a reduction of part count .The central protruding stator and back plate portions of the earlier machine become one unit, referred to as the back portion of the split housing, which has a centrally projecting stator portion.

Amend paragraphs 47-58 as follows:

[0047] Referring to FIG. 1 through FIG. 5b, the present rotary power device 10, when configured to operate as a four-phase internal combustion engine, comprises a medially split housing forming a front portion 14a and a back portion 14b having a ~~centrally protruding~~ central inwardly projecting portion 52. Taken together, these define a donut-shaped chamber having peripheral walls 15a and 15b. This chamber is elongated along one medial transverse axis so that the peripheral contour in the medial transverse plane has a substantially elliptical shape. Each mating [[face]] surface of the front and back portion ~~comprise~~ comprises a respective ~~face~~ cam groove 32a, 32b. Mating the two [[faces]] surfaces defines a cam track comprising the two grooves 32a, 32b and an annular channel 33 communicating with the chamber. The front portion 14a of the split housing includes a central opening 66 for rotatably carrying the rotor shaft 18 and hub portion 19 in a suitable bearing 12a. The back portion 14b includes [[a]] the central inwardly ~~centrally internally~~ projecting cylindrical stator portion 52. The two portions of the split housing are fixedly coupled together by suitable

means which may comprise a set of aligning holes 70 and tie rods (not shown). The back portion includes a side ignition port 64 for mounting an igniter 24 such as a spark plug or glow plug.

[0048] The central inwardly protruding stator portion 52 forms an integral portion of the back portion of the split housing and comprises a cylindrical tubular portion having a transverse wall 54, preferably disposed at a medial position, and defining a frontal intake channel ~~intake~~ 62 and an exhaust back channel 60. The frontal intake channel 62 comprises a peripheral intake port 58 and the back exhaust channel 60 comprises a peripheral exhaust port 56, where each port is defined over substantially a 90-degree angular extension.

[0049] A rotor assembly 20 is concentrically mounted within the substantially elongated donut-shaped chamber [[as]] defined by the outer walls 15a, 15b and by the inner wall of the ~~protruding~~ central inwardly projecting cylindrical portion 52. A preferred rotor assembly comprises, as depicted in FIG. 2, a donut-shaped rotor block comprising a cylindrical portion 36 with a front hub portion 19, a back hub portion 45, a semi-circular peripheral wall portion 35 and a central end shaft 18 rotatable about a rotation axis 22. The donut-shaped block may further comprise a multiplicity of ~~open-ended~~ radial compartments 44 communicating with a central bore portion 42 through inner openings 46. There is also an equal multiplicity of radial slots 38 disposed in alternating relationship with the radial compartments, so that each radial slot is closed at both sides and communicates with the central bore by means of the openings 47. The rotor assembly is rotatably mounted within the medially split housing by means of front and back ball bearings. The front bearing 12a has an inner race mounted on the hub portion 19 and an outer race mounted on a recessed wall portion of the front stator portion. The back ball bearing 12b has an inner race mounted on the hub portion 45 and an outer race mounted on a recessed wall portion of the back stator portion, so that a small clearance is provided between the inner wall of the rotor central bore and the outer wall of the ~~protruding~~ central inwardly projecting portion. The protruding shaft 18 and the central opening 66 of the front stator portion together define an annular inlet opening. The rotor assembly further includes an integrated axial ~~induction~~ fan

portion 41 disposed at the front portion of the central bore, [[and]] having ~~with blades~~ blade bases coupled to the end shaft 18 and having outer tips coupled to the rotor hub portion 19 of the rotor block so that an external fluid, such as an air charge for an internal combustion engine, enters the device by passing between the fan blades.

[0050] A multiplicity of vane assemblies 30 is preferably disposed in the rotor radial slots. These are arranged so that each vane assembly includes a vane plate portion 34 having three straight sides and one outer semi-circular side, a ring portion 48 fixed to the outer middle tip of the semi-circular vane portion by means of an extended stub portion 49, and a [[ball]] cam follower element 28 comprising a ball freely enclosed by the ring portion 48. During assembly the ~~vane elements with their respective ball elements~~ cam followers are momentarily disposed in one cam groove portion, such as the front cam portion 32a of the front housing portion 14a, and then enclosed by attaching the mating back housing portion 14b that has a respective cam groove portion 32b. As the rotor spins, the vanes reciprocate outwardly and inwardly along respective radii, where the motion of the vanes is controlled and guided by the mating cam groove 32a and 32b engaging the ~~ball elements~~ cam followers 28 entrapped within the vane ring portions 48 and slidably moving within the annular channel 33. The ball elements in the cam followers may be manufactured from a self-lubricating material in order to eliminate the need for oil lubrication. Alternatively, oil lubrication may be made by injecting oil mixed with an intake charge or by direct injection of oil into the cam groove through external channels (not shown). Furthermore, the cooling of the present engine may be made by providing water jacket cooling passages within the front and back portions of the split housing (not shown).

[0051] An embodiment of the rotary power device 10 configured to function as a four-phase internal combustion engine, as shown in FIG. 5a, FIG. 5b, FIG. 6, FIG. 7a and FIG. 7b, comprises a frontal intake channel 62 and a back exhaust channel 60 physically separated by a medial wall 54. The intake channel 62 comprises a peripheral port 58 communicating with the ~~rotor~~ radial compartments 44 through appropriate inner openings 46. Similarly, the exhaust channel 60 comprises a peripheral port 56 communicating with the ~~rotor~~ radial

compartments 44 through other inner openings 46. Each of the ports 58, 56 [[are]] is disposed at a preselected ~~positions~~ position so as to be axially aligned with portions of the inner openings 46. An igniter 24 is provided through an ignition port 64 in the side wall of the back portion of the split housing.

[0052] To operate a four-phase internal combustion engine made in accordance with the depiction of FIG. 1 through FIG. 7b, a starter motor (not shown) is connected to the shaft 18 to initiate the rotation of the rotor 20 about the rotation axis 22 in order to start the engine. Each cavity, which is bounded by two adjacent extended vanes and the outer peripheral wall and which encloses a radial compartment 44, moves through four equally angularly displaced phases of: intake, in which the cavity volume increases; compression, in which the cavity volume decreases; power, in which the cavity volume again increases; and exhaust, in which the cavity volume again decreases. During the intake phase, a charge comprising an air/fuel mixture or pure air alone is allowed to flow through the front housing portion 14a through the annular portion of the central opening 66 surrounding the protruding shaft, and is induced by the axial fan portion 41 of the rotor to flow through the intake channel 62 and finally [[to]] into the radial compartment 44 through a port 58 that is in communication with an ~~aligned compartment~~ inner opening 46. The effect of the axial fan portion is to induce and maintain an initially pressurized charge within the intake channel 62 at all times. This initial pressurization process, termed supercharging, is used to increase the mass flow rate during the intake phase and to thereby extract more power from the engine. During the compression phase, the trapped charge within the cavity and compartment ~~increase~~ increases in pressure as the vanes retract inwardly ~~retract~~ and as the cavity volume decreases. Near the end of the compression phase[[,]] an injection of a fuel charge (not shown) is made in those cases in which the intake fluid comprises only air, and this is followed by ignition of the charge by a spark or glow igniter 24 disposed in the ignition port 64. During the power phase, the expanding combustion gases provide a net pressure force on the outwardly extending vanes, causing the rotation of the rotor. During both the compression and expansion phases the outer wall of the central inwardly projecting ~~protruding~~ stator portion 52 blocks the compartment inner opening 46. During the exhaust

phase, the vanes retract inwardly as the cavity volume decreases. At the beginning of the exhaust phase, a brief blow down of combustion products takes place followed by the exhaust process as the volume decreases while the inner opening 46 registers with the exhaust port 56 in communication with the exhaust channel 60.

[0053] Another embodiment of the rotary power device of FIG. 1 is a device capable of operating as one of a motor-driven pump or compressor device, a fluid-driven motor, or an expander device. Replacing the back portion of the housing 14b with the one shown in FIG. 8 creates this embodiment. In this embodiment, the intake ports 58 comprise a diagonal pair communicating with the intake channel 62 . The exhaust ports 56 comprise another diagonal pair communicating with the exhaust channel 60. As depicted in FIG. 9, FIG. 10a and FIG. 10b, a rotary device according to this embodiment comprises two opposed intake phases alternated by two opposed exhaust phases. During intake phases the rotor inner ~~compartments~~ openings 46 are axially aligned with the intake ports 58 and during the discharge phases the inner openings 46 are aligned with the ~~discharge~~ exhaust ports 56.

[0054] In functioning as a pump or compressor, the rotor is made to rotate by coupling the end shaft 18 to a driving means, such as a motor. A sealed cavity is enclosed between two vanes having outer vane tips making a small-clearance engagement with the toroidal wall and the side wall of the chamber. Each cavity is preferably bounded by two vanes and encloses a radial compartment that goes through two 90-degree angular displacements of expanding volume alternated by two 90-degree angular displacements of contracting volume. During the expanding volume ~~ranges~~ phases fluid is sucked into the intake channel 62 through the front housing portion 14a and through the annular portion of the central opening 66 surrounding the protruding shaft. This is [[and]] enhanced by the axial fan portion 41 as the inner opening 46 registers with intake ports 58 in communication with the frontal intake channel 62. During the contracting volume ~~ranges~~ phases the fluid is pressurized and expelled as the inner openings 46 register with the ports 56 in communication with the ~~discharge~~ exhaust channel 60. Thus, simultaneous processes of diagonal intake and diagonal exhaust take place as the rotor rotates.

[0055] In functioning as a fluid driven motor or expander device, a pressurized fluid is communicated through the annular portion of the central opening 66 surrounding the protruding shaft, and is then ~~induced~~ inducted by the axial fan portion 41 that leads to intake channels 62 in communication with intake ports 58. This [[and]] provides a net pressure turning force on the outwardly extending vanes as the cavities expand, thus causing rotation of the rotor. At the same time, the resulting rotation causes the expulsion of the depressurized fluid through the ~~discharge~~ exhaust ports 56 in communication with the ~~discharge~~ exhaust channel 60 as the vanes retract inwardly ~~retract~~ and the cavities contract in volume.

[0056] Another embodiment of the rotary power device of FIG. 1 is one operating as a two-phase internal combustion engine in which the back housing portion 14b is replaced with one shown in FIG. 11. In this embodiment the disposition of intake and exhaust ports in the internal protruding portion is shown in FIG 11. In this embodiment the angular extension of the intake port 58 is less than the angular extent of the exhaust port 56. Also, the intake port 58 is defined over an overlapping angular extension with the exhaust port 56 in order to allow for air scavenging when the fresh charge displaces the spent charge. A diagonal pair of ignition port 64 may be used as injection ports adapted to receive injection means (not shown) for the initiation of the combustion process.

[0057] The operation of the two-cycle engine may be explained with reference to FIG.12, FIG. 13a and FIG. 13b In this embodiment the rotor goes through three distinct and twice repeated phases comprising compression, power, and intake-exhaust phases (i.e. scavenging). Each set of three phases takes place within a half revolution of the rotor and each phase takes place simultaneously with a similar diagonally opposed phase of the other set. During the intake-exhaust phase the intake ports 58 overlap with a portion of the respective exhaust ports 56 to allow initially pressurized air in the intake channel 62 to flow thorough the ~~aligned compartment~~ inner opening 46, thus displacing the products of combustion within that compartment through inner openings 46 aligned with the exhaust port 56 in

communication with the exhaust channel 60. During the compression phase the entrapped charge is compressed as the cavities contract toward their respective minima. In this phase the compartment inner openings 46 are ~~block~~ blocked by the peripheral wall of the central inwardly projecting ~~internal protruding~~ stator portion 52. Two diagonally opposed ignition or fuel injection means fire simultaneously to commence the power phase as sectors of opposing cavities expand. The power phase ends with ~~and~~ an exhaust blow down phase as the cavities start registering with exhaust ports 56 over a small angular displacement[[,]]. This is followed by a scavenging phase in which the newly admitted fresh air, initially pressurized by the axial fan portion 41, displaces the ~~product~~ products of combustion.

[0058] FIG. 14 through FIG. 19 depict an alternate embodiment of the rotary power device 10a configured to operate as a four-phase internal combustion engine. In this embodiment the back portion of the split housing shown in FIG. 1 is replaced with one shown in FIG. 14, which includes only a fontal intake channel 62 having an intake peripheral port 58 in communication with an axially aligned ~~rotor~~ radial compartment opening 44[[,]]. Moreover, ~~and~~ the plate portion comprises an exhaust channel 63 formed as a recess in the peripheral wall and connected to an exhaust port 57. The advantage of this alternate disposition of the exhaust port 57 in the plate portion of the back portion instead of in the central portion is to reduce possible short-circuiting leakage of the charge from the intake port 58 to the exhaust port 56 through the clearance between the central protruding portion of the outer wall and the inner wall of the rotor central bore. The operation as a four-phase engine for this embodiment is similar to the previous one except for the exhaust process, which takes place in the channel 63 leading to the exhaust port 57 in the plate portion of the split housing.